

Master Lecture

What You Should Know About Children's Sleep

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Owens: Children in the Head Start spend approximately one third or more of their lives sleeping. Thus, it is important to have some sense of what is normal and what is not in children's sleep development. Lecture objectives include (a) providing an understanding of normal sleep development in young children, (b) describing the neurobehavioral consequences of inadequate/disrupted sleep, and (c) discussing screening and clinical evaluation and treatment of common pediatric sleep problems.

What makes for the optimal sleeping environment? Seven factors play an integral role:

1. Developmental context (i.e., sleep, cognitive)
2. Health issues (i.e., illness, medication(s), nutrition)
3. Microsleep environment (i.e., bedding, sleeping position, etc.)
4. Macroenvironment (i.e., the light, the noise, the temperature of the room)
5. Sleep practice (i.e., schedules, feeding, napping, cosleeping)
6. Social/emotional context (particularly in infants, attachment and the relationship between mother and child has a key impact on sleeping practices)
7. Sociocultural context (i.e., values, parenting practices)

A frequently asked question is, "How much sleep does my child need?" The answer is unknown because those types of experiments are difficult to do. It is known, on average, how much sleep parents report that children of different ages get. How that is related with how much they need is unknown. However, particularly in the 1st year of life, there is a significant variation in the amount of sleep in a 24-hour period. For children at that age, there is napping as well as nocturnal sleep. Even until the midteenage years, there is a great deal of variability in the amount of sleep that children get.

There are two key factors that distinguish sleep in newborns. Sleep is basically divided into two types: REM sleep and non-REM sleep. Non-REM sleep is composed of four different stages. REM and non-REM sleep states organize the third trimester of pregnancy. There are essentially three different sleep states: (a) active sleep (light REM sleep), (b) quiet sleep (non-REM or deep sleep), and (c) an intermediate form. Newborns go immediately into REM sleep as they fall asleep, quite different from what adults do. The total diurnal and nocturnal sleep time for newborns ranges from 16–20 hours per day. Sleep episodes are characterized by 3–4 hour periods of sleep and 1–2 hours awake. Breastfed newborns have more frequent wakings. Sleep cycles are also highly linked to hunger and feeding in all newborns.

The sleep picture changes for infants who typically sleep between 16 and 20 hours a day, with 9 to 12 hours of nocturnal sleep. The number of naps decreases with age from four to one. The length of naps can range from 30 minutes to 2 hours. Their sleep time is broken up into 3- or 4-hour blocks, separated by several hours of being awake. Developmental issues that arise include issues related to attachment, motor milestones (e.g., attainment of milestones such as

pulling to standing, crawling, walking, oftentimes associated with a temporary regression in sleep patterns or problems with sleep), and separation anxiety.

What are an infant's sleep onset associations? It is critical to highlight the importance of the development of self-soothing as a skill and to take into account the impact of negative sleep associations as a contributor to sleep problems. For example, if an 18-month-old starts to have significant problems with separation anxiety, those problems may translate into difficulty falling asleep or staying asleep during the night. Sleep onset associations are conditions or props that an infant or a child becomes conditioned to in order to fall asleep. Another example is an infant who might be being rocked, fed, or held to fall asleep. Those associations can become problematic, leading to arousals during the night. Thus, some children are able to soothe themselves back to sleep while others signal the parents and need parental intervention in order to fall back asleep.

There are important sleep developmental milestones that occur around 3–4 months of age. One is called sleep consolidation, operationalized as sleeping from midnight to 5:00 a.m. Generally infants become capable of sleeping for a prolonged period at around this time. By 9 months of age, there still is a percentage of infants who have not been able to achieve this and continue to have night wakings. The other sleep developmental milestone that infants become capable of around this time is sleep regulation (being able to self-soothe and fall asleep without intervention, that is, without assistance from parents). It is a learned behavior. Infants need to be taught how to self-soothe. Sometimes parents do not understand how to do that.

Regarding cosleeping, the American Academy of Pediatrics (AAP) has a statement on cosleeping and Sudden Infant Death Syndrome (SIDS) risk. The AAP put forth that bed sharing (having an infant or child sleep in the same bed as a parent) is not recommended during the 1st year of life. Based on numerous studies, conclusions were that cosleeping increases the risk for SIDS. The AAP also recommended pacifier use in the 1st year of life based on the same premise that infants who use pacifiers are less likely to die of SIDS.

One issue that arises is that many ethnic and racial groups in the US are more likely to cosleep than others. In particular, African American families and Hispanic families are more likely than Caucasian families to cosleep. However, about 80–90% of the rest of the world outside of the US and Western Europe cosleeps, and they have lower SIDS rates than we do. What can we advise families? There are certain high-risk groups for bed sharing and SIDS, including mothers who are obese, who are smokers, who use alcohol or sleeping aids, or mothers sleeping on a surface other than a bed, such as a couch. In most of these families, cosleeping should not be recommended. Unfortunately, in many cases, those are the families that are most likely to cosleep because cosleeping in the US tends to be associated with lower socioeconomic status, poverty, overcrowding, single mothers, and lower maternal education levels. The debate continues, however. In Asia for example, cosleeping is a more universal practice and no association between cosleeping and the demographics noted above have been found. Additionally, there is clearly a difference between “lifestyle cosleeping” where families elect to cosleep or bed-share and “reactive cosleeping” where a parent takes the child into bed to address a sleep problem, such as trouble falling asleep or night wakings. That parent does not want the child in bed with her or him. Although that is a temporary solution, it

ends up with the child in bed with the parent. That is a different situation where underlying sleep problems need to be addressed.

The total sleep time for toddlers should be between 12–13 hours. Most give up the second nap by 18 months. Developmental issues such as the mastery of independent skills, cognitive development milestones, and/or separation issues can lead to sleep problems. About 20–30% of toddlers will have sleep problems at one time or another. This is the age where sleep problems once established can persist and become more entrenched behavior that is more difficult to get rid of.

A substantial percentage of preschoolers are still napping at age 5. This has become a political issue as many school systems are eliminating naps for preschoolers. With No Child Left Behind and a drive to fill every waking hour with education, many children are getting shortchanged. If they are too tired to learn, having an extra hour of instruction instead of naptime is not beneficial.

There are some interesting racial and cultural differences in napping. A study conducted in rural Mississippi published in *Pediatrics* found that a substantial percentage of the African American children were still napping at ages 7, 8, and 9. They have the same 24-hour sleep duration as Caucasian children, but they had a shorter nocturnal sleep period and were regularly napping during the day. Typically, if a school-aged child is napping, that is a red flag since that means that they are either not getting enough sleep or the quality of their sleep is compromised in some way. There may be certain groups of children who use napping as a supplement to a shortened nocturnal sleep period.

In middle childhood, total sleep time is about 10–11 hours. School-aged children are about the physiologically most alert human beings on Earth. If they fall asleep in the classroom, be concerned. This is also the age when children start to tend to declare a preference for being an owl (someone who tends to go to bed later and sleep later) versus a morning lark. The tendency to be an owl gets exaggerated in adolescence, and they simply cannot fall asleep as early as they used to. This is the age where other things start to interfere and take the place of sleep as a priority. Children may have hockey practice until 9:00 p.m. or are Instant Messaging until 11:00 p.m. This is an important time to intervene. Get the TV out of the bedroom. A 1998 study of 4- to 10-year-olds from an affluent, upper middle-class, suburban community, found that 25% had television sets in their bedrooms. It is probably 75% today.

The National Sleep Foundation's Sleep in America Poll in 2006 focused on adolescents. Approximately 97% of adolescents had at least one electronic media device in their room. These children are being bombarded with high-energy stimulation and activities and demands, and then we expect them to drop it and fall asleep. In the National Sleep Foundation poll, about 80% of parents thought their children were getting enough sleep while about 80% of children polled were not getting enough sleep. When sleep goes wrong, what is happening? One is not getting enough sleep for the sleep needed, one's sleep needs are not being met, or the quality of sleep is compromised in some way. One may be getting enough sleep, but it is fragmented by something like obstructive sleep apnea, for example. There can be a primary disorder of excessive daytime sleep. This would be something like narcolepsy, which is

uncommon, but it exists. There could be a circadian rhythm disorder, which means that the quality and the quantity of sleep is normal, but it is misplaced in the 24-hour schedule.

There are some children, oftentimes teenagers, with delayed-sleep phase syndrome where sometimes they cannot fall asleep until 2:00, 3:00, or 4:00 a.m. Obviously, they want to sleep for 8 or 9 hours after that but cannot because they have to get up and go to school. That type of circadian rhythm problem can cause significant difficulties. Sleep restriction or poor quality sleep causes changes in mood. Children are more likely to be irritable, whiny, cranky, and have low frustration tolerance. They are more likely to have behavioral problems, both internalizing behaviors, such as anxiety, and externalizing behaviors, such as aggression or impulsivity. They could have neurocognitive deficits such as attention problems or memory problems. Higher level functions like working memory, the ability to reflect on behavior, or the ability to inhibit behavior are impacted by sleep loss or poor quality sleep. Then there are performance deficits related to that. If a child does not sleep, there is a parent or caregiver who is not sleeping. There are all types of repercussions on families. For families already stressed or vulnerable, this may be the last straw.

There are also physical repercussions of sleep problems, including potential growth problems. Growth hormones are primarily secreted during slow wave or deep sleep during the night. If there is not enough of that sleep, it might impact growth, including immune and endocrine functioning. Sleep, circadian rhythms in particular, regulates all kinds of physiologic systems in the body, not just sleep and wakefulness.

There is also evidence suggesting a relationship in adults and potentially also in children between obesity and inadequate sleep. This is currently an area of intense interest because there is an epidemic of pediatric obesity in the US. The curves of children who are obese and the curves of the average sleep duration in children are almost parallel. How much of this potentially is linked to inadequate sleep? A study was conducted a couple of years ago that showed accidental injuries are more common in children who have sleep problems because they are clumsy, inattentive, and have poor impulse control.

The most common behavioral insomnias of childhood are sleep-onset association and limit-setting sleep disorder. These can present themselves as either bedtime resistance struggles or night wakings. In sleep-onset association insomnia, the child has learned to fall asleep with only certain conditions such as being held, rocked, or fed. Usually those conditions are present at bedtime so the child does not have difficulty falling asleep. All of us have brief arousals during the night; it is a normal part of the sleep architecture. These children, when they have normal arousals, need those same conditions to fall back to sleep. If they needed a parent to sit and pat their back when they fall asleep at bedtime, they are going to need that parent to pat their back at 3:00 a.m. Without parental interventions, there may be prolonged night wakings.

Treatment of sleep onset association disorder centers on unconditioning the child from having to have these associations in order to fall asleep. A regular bedtime routine is instituted and the child is put to sleep drowsy but awake. At around 3 or 4 months, parents can start to put their babies down drowsy but awake, so that the last thing they remember as they are falling

asleep is not being held, fed, or rocked, but being able to settle on their own. There are also a variety of graduated extinction methods, such as the Ferber Method, that can be used for night wakings as well. That is a system of checking, so that the parent goes in, briefly reassures the child, does not have prolonged interaction, does not pick the child up, leaves, waits for a certain amount of time, returns to the room, briefly interacts, leaves for a little bit longer, comes back in the room, and so on. Somewhere in the interim while the parent has left the room, the child will fall asleep on her own. Generally that method works well.

There are two common mistakes parents make. First, they do not anticipate the “extinction burst,” which, when a behavioral treatment is started, makes things worse before they get better. The child is going to cry louder and longer on the first few nights. If parents do not anticipate that, they may give up. They need help understanding that may happen. Second is consistency. The first five times at night they let the baby cry, and then at 4:00 a.m. they say “I have to sleep. I have a meeting tomorrow. I cannot stand this any more.” and they take the child into bed with them. The child is taught that if she cries long enough, eventually she will get into her parents’ bed. It becomes more difficult to extinguish the behavior than if the child were taken into the parents’ bed every night.

The other type of behavioral insomnia is limit-setting sleep disorder where parents are unable or unwilling to set limits around bedtime. Oftentimes, these parents have trouble setting limits in multiple areas, and bedtime is one. Many patients who come to the sleep clinic have no bedtime. A child falls asleep in front of the television at some point during the evening, and then the parent carries him into bed. Oftentimes, it is prolonged by what we call curtain calls (i.e., another drink, another story, another hug). Parents of preschoolers are helped to understand that they are not bad people if they make their child go to bed, that going to bed and sleeping are important, and that it is something everybody in the family needs to do.

There are numerous ways to work with parents on appropriate limit setting. There are parents who do not understand how much sleep a child needs so they are either putting a 9-year-old to bed at 6:30 p.m., which is too early, or they are allowing a 3-year-old to stay up until 11:00 p.m.. If there is no school the next day, maybe that is okay, although oftentimes those children end up not getting enough sleep. Parents can also use carrots as well as sticks at that age. One can use a sticker chart—preschool children will do anything for a sticker. The critical piece, however, is ensuring that parents understand that whatever they do, they have to be consistent. There is no question that it is much harder to be consistent at midnight than it is during the day. There are also general principles of good sleep hygiene or good sleep habits, including having a regular bedtime and waketime that is relatively the same on weekdays and weekends. Caffeine, rigorous exercise, and heavy meals should be avoided shortly before bed.

Medication for sleep should generally be avoided. There are currently no FDA-approved sleep medications in pediatrics. Although there may be a role for medication for some special needs populations, in general, if medication is used, it is always combined with behavioral treatment strategies. As with adults with insomnia, if they are given Ambien or Sonata, they will fall asleep, but if behavioral interventions are not instituted, as soon as the sleeping medications are stopped, their sleep problems are going to return. Sometimes medication is used as an adjunct, particularly in situations where families are at their wits’ end. There have been situations

where there was the potential for child abuse because the parent was so exhausted and frustrated with the sleep problems. While behavioral interventions, which take a while to work, are being instituted, medication can be helpful as a temporary bridge. There should be caution if a child has untreated sleep-disordered breathing, such as obstructed sleep apnea, or if the child is taking other medications.

Obstructed sleep apnea, or sleep-disordered breathing, is a common issue in the preschool-aged population and is important to identify and treat. There is a spectrum of sleep-disordered breathing. At one end of the spectrum, there is primary snoring, which is snoring without any evidence that there are abnormalities in breathing, oxygen level, and so forth. There are currently studies that suggest even snoring without these kinds of breathing ventilatory abnormalities may cause neurocognitive and neurobehavioral deficits in children. Snoring may not be as benign as once thought. In the middle is obstructive hyperventilation, which is a reduction in air flow. That is the most common pattern of sleep-disordered breathing seen in children. At the other end of the spectrum is apnea, which means absence of breathing.

Primary snoring occurs in about 10% of children. Approximately 2–3% of preschool-aged children have obstructive sleep apnea. This may be an underestimate because these are survey studies. The peak age is between 2 and 7 because that is the age at which tonsils and adenoids are most likely to be enlarged. That is still the most common risk factor for this disorder in children as opposed to obesity in adults. However, because so many children now are overweight and obese, weight is starting to be seen as a major risk factor for obstructive sleep apnea. Anything that causes upper airway blockage or obstruction (i.e., enlarged tonsils and adenoids) can cause this breathing problem. However, children who have other types of congenital syndromes because of their upper airway anatomy are at higher risk, particularly children with Down syndrome. It is estimated that approximately 70% of children with Down syndrome will have some evidence of sleep-disordered breathing. Also at greater risk are children who have chronic allergies, sinus infections, and asthma. Common symptoms include loud, nightly snoring. They look like they are working hard to breathe. Their chest wall moves in and out, they are restless sleepers, and they sweat a lot at night. They may sleep in unusual positions, with their necks tipped back to keep their airway open. Parents report being very concerned about their children's breathing and have taken them into bed to sleep with them because they are worried their child is going to stop breathing during the night.

In the daytime, studies have found that many symptoms overlap with attention deficit hyperactivity disorder (ADHD). Every child who is being evaluated for ADHD or for learning, behavior, or mood issues should be screened for sleep problems as the symptoms are practically interchangeable. Daytime sleepiness in preschoolers may not be seen in their yawning, rubbing their eyes, or saying, "I am tired." Rather, they are running around in circles, cranky, whiny, and/or just miserable to be with. Many of these same symptoms, including poor school performance, can be reflective of sleep-disordered breathing.

Children may have evidence of allergies. They are often mouth breathers whose faces may become elongated because they are so used to mouth breathing all the time. Many of these children have enlarged tonsils. However, there is no constellation of symptoms that differentiates a child who has primary snoring versus a child who has obstructive sleep apnea.

Thus, an overnight sleep study is needed for diagnosis. In that situation, a child is brought into the sleep lab with a parent and is evaluated using different monitors and electrodes. Nothing in the evaluation is painful. Breathing, heart rate, and sleep stages are measured throughout the night. Data give an indication as to whether or not the child may have obstructive sleep apnea. In most cases, if enlarged tonsils and adenoids are the root cause, removing them fixes the problem. However, because so many children have other risk factors such as asthma or obesity, follow-up may be needed. There are other types of treatments available.

Partial arousal parasomnias are essentially night terrors, or sleep terrors, and sleepwalking. They occur almost exclusively in the first third of the night because that is where slow wave sleep or deep sleep is concentrated. Their brains are asleep so they do not remember the events the next day. Anything that increases slow-wave sleep, like being sleep-deprived, is going to potentially exacerbate sleepwalking and night terrors. Additionally, oftentimes it also runs in families. Night terrors are relatively uncommon, but when they occur they are dramatic events. Children often wake up with a bloodcurdling scream, agitated, and with hearts racing. They do not recognize parents or respond appropriately. After 3–5 minutes they go right back to sleep. It is one of those situations where the observer is far more upset by the event than the child, who has no recollection of it the next morning. Most children will outgrow both sleepwalking and night terrors, certainly by adolescence.

A quick screening instrument was developed a few years ago and piloted in the ambulatory pediatrics clinic called the BEARS, which stands for Bedtime Problems. Does your child have any trouble going to bed or falling asleep? Is your child sleepy or seem overtired during the day? The term “excessive daytime sleepiness” is used because children may not act in ways that parents define as sleepy. Do they have wakings during the night? For how long? How often does this occur? What time do they usually go to bed and get up? Do you think your child is getting enough sleep? Finally, does your child snore? Using this will identify the vast majority of sleep issues in most children. When a problem is identified, then additional tools are used to tease out what is occurring, including keeping sleep diaries that can be important in better determining the problem. Overnight sleep studies are conducted in various situations, such as when sleep disordered breathing or nighttime seizures are suspected or to look for periodic limb movements, which are rhythmic kicking movements during the night that can disrupt sleep in adults and children.